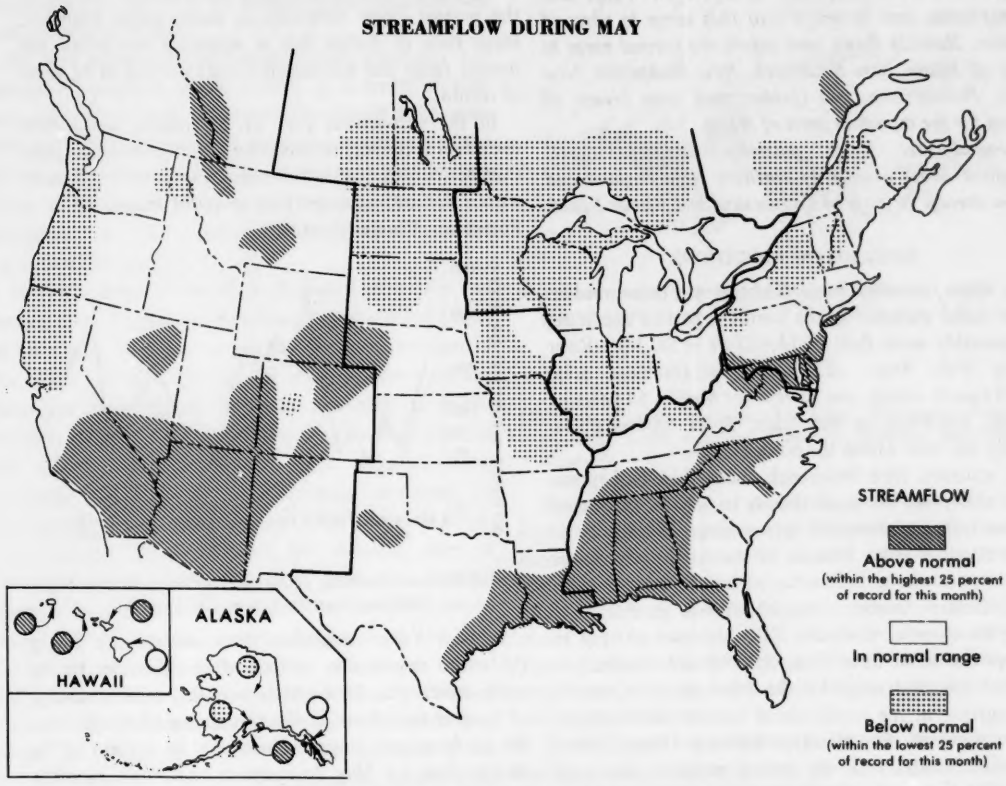
WATER RESOURCES REVIEW for MAY 1980

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH



STREAMFLOW AND GROUND-WATER CONDITIONS

Mount St. Helens Volcano erupted violently on Sunday, May 18. Ash, mud and debris, carried by glacial meltwater, washed into the Cowlitz River, choking the river channel and increasing the flood potential. Unprecedented flooding occurred in the Toutle River, which drains the north and west slopes of the volcano before emptying into the Cowlitz River. Flooding was also reported in parts of Alabama, Colorado, Georgia, Louisiana, Nebraska, Oklahoma, and Texas.

Streamflow increased seasonally in Alaska, Oklahoma, Texas, and in most Rocky Mountain States, generally decreased seasonally in Arizona, Hawaii, and most States in the eastern two-thirds of the United States, and was variable elsewhere.

Monthly mean flow remained in the above-normal range in large areas in and adjacent to Arizona and Alabama, and were highest of record for the month in parts of Mississippi. A large area of below-normal streamflow developed in the Upper Midwest. Monthly mean flows were lowest of record for the month in parts of Alaska and Maine.

Ground-water levels generally declined in the Northeast Region. Levels continued above average in northern New England and below average in parts of Connecticut and Rhode Island. In the Southeast Region, levels declined in Virginia, Alabama, and Georgia, but trends were mixed elsewhere; levels were mostly above average. In the western Great Lakes Region, levels declined in Minnesota and held steady in Michigan, and levels were above and below average; elsewhere, trends were mixed and levels were about average. In the Midcontinent Region, levels mostly declined in North Dakota, Iowa, and Kansas; trends were mixed elsewhere. Levels were near or above average in Nebraska, above and below average in Texas, and mostly below average elsewhere. In the West, levels held steady or rose in Montana and Idaho; declining levels prevailed for the most part in southern California and Arizona. Trends were mixed elsewhere in the region. Levels were below average in Washington and Arizona, mostly below average in Idaho and New Mexico, and mixed with respect to average elsewhere in the region.

New high ground-water levels for May occurred in Alabama, Georgia, Louisiana, Nevada and Utah, and new alltime highs were reached in Kentucky and Louisiana. New low levels for May were recorded in Arizona, Arkansas, Idaho, Kansas, New Mexico, and Utah, and a new alltime low was reached in Idaho.

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

Streamflow generally decreased seasonally except in Quebec and New Brunswick where flows were variable. Monthly mean flows remained in the above-normal range in parts of Maryland, New Jersey, New York, and Pennsylvania, and increased into that range in parts of Quebec. Monthly flows were below the normal range in parts of Maine, New Brunswick, New Hampshire, New York, Pennsylvania, and Quebec, and were lowest of record for the month in parts of Maine.

Ground-water levels generally declined. Levels remained above average in northern New England and below average in parts of Connecticut and Rhode Island.

STREAMFLOW CONDITIONS

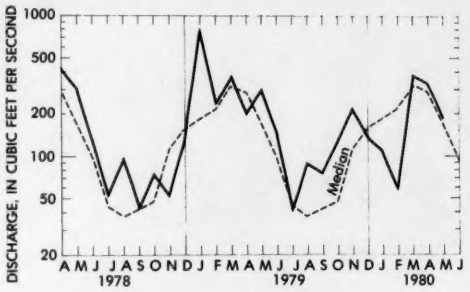
In Maine, monthly mean discharge was below median at all index stations. In the northern part of the State, the monthly mean flow of 14,420 cfs in St. John River below Fish River, at Fort Kent (drainage area, 5,690 square miles), was lowest for May in 54 years of record. Elsewhere in the State, flows decreased seasonally but were within the normal range.

In southern New Brunswick, mean flow in Lepreau River at Lepreau decreased sharply to only 77 percent of median and was below the normal range. Monthly mean flows at other index stations in the Atlantic Provinces were near or above median but within the normal range.

In eastern Quebec, monthly mean discharge of Outardes River at Outardes Falls increased sharply to 6 times the mean flow of April 1980 and remained in the above-normal range for the 2d consecutive month. By contrast, in the south-central part of the Province, mean flow of St. Maurice River at Grand Mere decreased, contrary to the normal seasonal pattern of increasing flow, was only 54 percent of median, and was below the normal range for the 4th time in the past 5 months. Elsewhere in the Province, mean flows at index stations increased in extreme eastern and western parts of the Province and decreased in extreme southern Quebec but were within the normal range.

In central New Hampshire, monthly mean discharge of Pemigewasset River at Plymouth decreased seasonally to less than ½ the median flow for May and was below the normal range. Similarly, in southeastern Vermont, mean flow of Batten Kill at Arlington was below the normal range and was second lowest for May in 52 years of record.

In the east-central part of the region, streamflow decreased seasonally in Massachusetts, Rhode Island, and Connecticut, and monthly mean flows were generally within the normal range. (See graph of Branch River at Forestdale, Rhode Island.)



Monthly mean discharge of Branch River at Forestdale, R.I. (Drainage area, 91.2 sq mi; 236.2 sq km)

In New York, streamflow decreased steadily during the entire month due to lack of precipitation. In the south-central part of the State, monthly mean discharge of Susquehanna River at Conklin decreased sharply into the below-normal range and was only 64 percent of the median flow for May. In northern New York, monthly mean flows of Hudson River at Hadley and Mohawk

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River at Cohoes decreased seasonally to 69 and 55 percent of median, respectively, and were below the normal range. Also in northern New York, flow at the index station, West Branch Oswegatchie River at Harrisville, decreased seasonally, was below the normal range, and was 65 percent of median. By contrast, on Long Island, monthly mean discharge of Massapequa Creek at Massapequa remained in the above-normal range and was 166 percent of median.

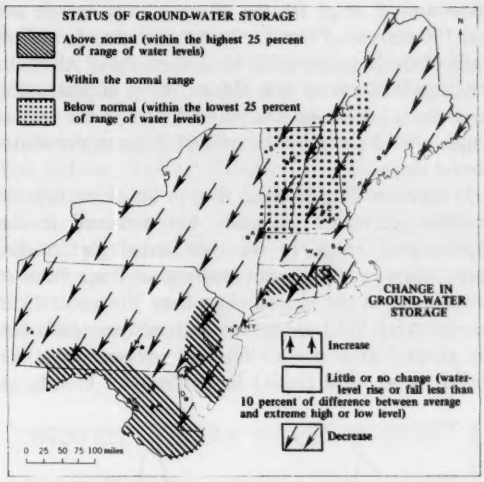
In New Jersey, streamflow decreased seasonally but generally remained above median as a result of high carryover from April augmented by runoff from rains that fell early in the month. In the southern part of the State, monthly mean discharge of Great Egg Harbor River at Folsom decreased to 128 percent of median but remained in the above-normal range for the 2d consecutive month.

In Pennsylvania, streamflow decreased seasonally and ranged from 67 percent of median (below-normal range) at Oil Creek at Rouseville, in the northwestern part of the State, to 141 percent of median (above-normal range) at Monongahela River at Braddock, in southwestern Pennsylvania. In the Susquehanna River basin in the east-central part of the State, monthly mean discharge as measured at Harrisburg decreased to 73 percent of median but remained in the normal range.

In eastern Maryland and the adjacent area of Delaware, in the Choptank River basin, the seasonal decrease in streamflow as measured at the index station near Greensboro, Md., was less than normal and flow increased into the above-normal range. In central Maryland, monthly mean discharge of Seneca Creek at Dawsonville decreased seasonally but was more than twice the median flow for May and remained in the above-normal range for the 3d consecutive month. Flow of the Potomac River near Washington, D.C. decreased seasonally during May to 197 percent of median and remained above the normal range for the 2d consecutive month.

GROUND-WATER CONDITIONS

Ground-water levels declined in most of the region. (See map.) Levels rose or changed only slightly in much of Maryland, New Jersey, and southeastern Massachusetts. Levels remained below average in parts of northern New England. Above-average levels persisted in parts of Connecticut and Rhode Island, and levels were above average also in some wells in Maryland and New Jersey.



Map shows ground-water storage near end of May and change in ground-water storage from end of April to end of May.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

Streamflow decreased seasonally in all parts of the region except in north-central Tennessee, where flows increased, contrary to the normal seasonal pattern. Monthly mean discharges remained in the above-normal range in parts of each State except Kentucky. Monthly mean flows were highest of record for the month in parts of Mississippi and decreased into the below-normal range in parts of Kentucky. Flooding occurred in Alabama and Georgia.

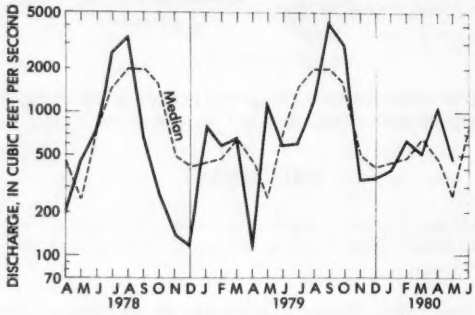
Ground-water levels declined in Virginia, Alabama and Georgia; trends were mixed elsewhere. Levels were generally above average in the region; however, below-average levels occurred in parts of West Virginia and locally elsewhere.

STREAMFLOW CONDITIONS

In northwestern Georgia, three deaths were reported to have resulted from localized flash flooding along small streams in the Atlanta area and westward to the Alabama line on the 23d. Monthly mean discharge of Etowah River at Canton, about 30 miles north of Atlanta, remained above the normal range for the 3d consecutive month and was 160 percent of median. In the western part of the State, mean flow in Apalachicola River, as measured at Chattahoochee, Fla., near the Georgia-Florida boundary, remained in the

above-normal range for the 3d consecutive month and was 172 percent of median. In east-central and southern parts of the State, monthly mean discharge of Altamaha River at Doctortown and Alapaha River at Statenville, respectively, decreased sharply and were in the normal range, after 2 successive months of flows in the above-normal range.

In northern Florida, mean flow in Suwannee River at Branford decreased seasonally but remained in the above-normal range. In the west-central part of the State, where monthly mean discharge of Peace River at Arcadia was in the normal range from November 1979 through April 1980, mean flow decreased seasonally but was about 2 times median for May and was above the normal range. (See graph.) In southeastern Florida, at



Monthly mean discharge of Peace River at Arcadia, Fla. (Drainage area, 1,367 sq mi; 3,541 sq km)

Miami, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, was 45 times the median flow for the month.

In Mississippi, monthly mean flows at all index stations remained above the normal range for the 3d consecutive month. In the southeastern part of the State, the monthly mean discharge of 37,270 cfs in Pascagoula River at Merrill (drainage area, 6,600 square miles) was highest for May since records began at that site in October 1930. In northeastern and central parts of the State, respectively, mean flows of Tombigbee River at Columbus and Big Black River near Bovina decreased seasonally but were 2 and 3 times their respective median flows for May.

In north-central Tennessee, monthly mean flow in Harpeth River near Kingston Springs increased, contrary to the normal seasonal pattern of decreasing flow, was 337 percent of median, and remained above the normal range for the 11th time in the past 14 months as a result of high carryover flow from April augmented by increased runoff near midmonth. Monthly mean flow of Buffalo River near Lobelville, in the western part of the State, and of French Broad River below Douglas Dam, in extreme eastern Tennessee, decreased seasonally and remained in the above-normal range for the 3d consecutive month.

In southern Kentucky, mean discharge of Green River at Munfordville decreased seasonally and was less than median but was within the normal range for the 3d consecutive month. In the northern part of the State, monthly mean flow of Licking River at Catawba also decreased seasonally and was less than median but was in the below-normal range for the 2d time in the past 4 months.

In extreme northern West Virginia, mean flow of Potomac River at Paw Paw decreased seasonally but was 213 percent of median and remained above the normal range as a result of sharply increased runoff early in the month. Elsewhere in the State, mean flows of Greenbrier River at Alderson and Kanawha River at Kanawha Falls also decreased seasonally, were greater than median, and were within the normal range.

In northern Virginia, monthly mean discharge of Rapidan River near Culpeper decreased sharply but remained above the normal range for the 8th time in the past 10 months as a result of high carryover flow from April augmented by increased runoff during the latter part of the month. In the southeastern part of the State, where mean flow of Nottaway River near Stony Creek was above the normal range in 16 of the 17 months preceding May, monthly mean discharge decreased sharply in May and was in the normal range. Elsewhere in the State, mean flows remained in the normal range.

In the eastern Piedmont and Coastal Plain of North Carolina, mean flow of Neuse River near Clayton decreased seasonally but was in the above-normal range as a result of increased runoff late in the month. In the extreme western part of the State, monthly mean discharge of French Broad River at Asheville also decreased seasonally but remained above the normal range for the 3d consecutive month as a result of high carryover flow from April augmented by increased runoff during the latter part of the month.

In northeastern South Carolina, mean discharge of Pee Dee River at Peedee decreased seasonally but remained in the above-normal range as a result of high carryover flow from April. Elsewhere in the State, monthly mean flows of Lynches River at Effingham and North Fork Edisto River at Orangeburg decreased seasonally and were within the normal range.

In extreme southwestern Alabama, moderate flooding occurred in Mobile County at midmonth as a result of rapid runoff from intense rainfall on the 16th. Peak discharges at gaging stations in the county were approximately equal to that of an 8-year flood event at the

respective sites. In the west-central part of the State, monthly mean flow of Tombigbee River at Demopolis lock and dam, near Coatopa, decreased seasonally but remained above the normal range for the 10th time in the past 12 months. In extreme northern Alabama and the adjacent area of Tennessee, monthly mean discharge of Paint Rock River near Woodville continued to decrease seasonally but remained in the above-normal range for the 3d consecutive month and was 3½ times the median discharge for May as a result of high carryover flow from April augmented by increased runoff from rains near midmonth. In the central and southeastern parts of the State, monthly mean flows of Cahaba River at Centreville and Conecuh River at Brantley, respectively, decreased seasonally and remained in the above-normal range.

GROUND-WATER CONDITIONS

In West Virginia, ground-water levels rose in the southwestern third of the State and in Monongalia County, but declined elsewhere. Levels were below average in a few central and northeastern counties and were near or above average elsewhere.

In Kentucky, levels continued to rise in the Louisville-Jefferson County area and were at or near record highs. The level in the water-table observation well in glacial outwash in this area rose slightly and reached a new alltime high level in 34 years of record. Levels declined slightly elsewhere but were generally above average statewide.

In Virginia, levels declined but were above average. Levels have been above average in the Tyler well in Louisa County, and in the Matoaka Manor well at Colonial Heights, for the past 16 and 19 months, respectively.

In western Tennessee, the artesian level in the key well in the "500-foot sand" near Memphis rose nearly a foot but continued below average by more than 14 feet.

In North Carolina, levels rose in the mountains but declined in the Piedmont and in the Coastal Plain. Levels were above average statewide.

Ground-water levels in Mississippi rose slightly in the shallow water-table wells. Levels changed little in observation wells in other aquifers in the State except in the Late Cretaceous aquifers in the Tupelo area, where levels declined slightly as pumping increased.

Levels declined slightly in the key wells in Montgomery and Centreville, but were above average. In the Centreville well, despite the decline, the level was at a new high for May in 28 years of record.

In Georgia, levels in wells in the Piedmont held steady, but were nearly 2 feet above those of May 1979 The level in one observation well in the Atlanta area was the highest for May since 1975. Levels in the principal artesian aquifer in the coastal counties declined as much as 2 feet. Levels in the water-table aquifer were about a foot above average. In the southwest, levels declined 2 to 6 feet, but were 2 to 5 feet higher than a year ago.

In Florida, levels rose in the extreme northwest but declined in some areas in the northern and central peninsular part of the State. Levels ranged from 4 feet above average near Pensacola to 3.4 feet below average near Mulberry in west-central Polk County. In southeastern Florida, levels rose slightly, and ranged from 2 feet above average in Dade County to ½ foot above average in St. Lucie County.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

Streamflow increased seasonally in parts of Ontario but decreased in all other parts of the region. Monthly mean flows were in the below-normal range in parts of Ontario and in parts of all States except Ohio. Below-normal flows were observed at 63 percent of the index stations in the region.

Ground-water levels declined statewide in Minnesota and held steady in Michigan; levels were above and below average. Elsewhere in the region, trends were mixed and levels were about average.

STREAMFLOW CONDITIONS

In Minnesota, where monthly mean flows generally were near median and within the normal range in April, mean discharges decreased sharply and were below the normal range at all index stations in May. For example, in the west-central part of the State, monthly mean discharge of Buffalo River near Dilworth was 98 percent of median and in the normal range in April, but decreased into the below-normal range and was only 24 percent of median in May. Similarly, in eastern Minnesota, mean flow of Mississippi River at Anoka was 94 percent of median and in the normal range in April, but was only 37 percent of the median discharge in May and was below the normal range. In the extreme northeastern part of the State, tributary to Lake Superior, the monthly mean discharge of 101 cfs in Baptism River near Beaver Bay (drainage area, 140 square miles) was the 3d lowest for May in 53 years of record. Similarly, in extreme northwestern Minnesota, tributary to Red River of the North, the mean flow of 80 cfs in Roseau River near Caribou (drainage area, 1,570 square miles) (International gaging station) was

(Continued on page 7.)

Provisional data: subject to revision

SELECTED DATA FOR THE GREAT LAKES, GREAT SALT LAKE, AND OTHER HYDROLOGIC SITES

GREAT LAKES LEVELS

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955

(Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations above mean sea level datum of 1929, add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.)

Lake	May 31, 1980	Monthly mean, May		May		
		1980	1979	Average 1900–75	Maximum (year)	Minimum (year)
Superior (Marquette, Mich.)	600.45	600.43	600.88	600.38	601.53 (1951)	598.30 (1926)
Michigan and Huron (Harbor Beach, Mich.)	579.58	579.49	579.57	578.31	580.60 (1973)	575.79 (1964)
St. Clair (St. Clair Shores, Mich.)	575.05	575.13	574.98	573.58	576.06 (1974)	571.64 (1934)
Erie (Cleveland, Ohio)	572.42	572.47	572.12	570.82	573.25 (1973)	568.43 (1934)
Ontario (Oswego, N.Y.)	245.96	245.98	246.06	245.42	247.95 (1952)	242.67 (1935)

GREAT SALT LAKE

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	May 31, 1980	May 31, 1979	Reference period 1904–79		
			May average, 1904–79	May maximum (year)	May minimum (year)
Elevation in feet above mean sea level:	4,200.10	4,199.80	4,199.10	4,204.90 (1923)	4,192.80 (1963)

LAKE CHAMPLAIN, AT ROUSES POINT, N.Y.

Alltime high (1827–1979): 102.1 (1869). Alltime low (1939–1979): 92.17 (1941).	May 30, 1980	May 31, 1979	Reference period 1939–78		
			May average, 1939–78	May max. daily (year)	May min. daily (year)
Elevation in feet above mean sea level:	96.04	97.69	98.39	101.44 (1972)	94.91 (1965)

FLORIDA

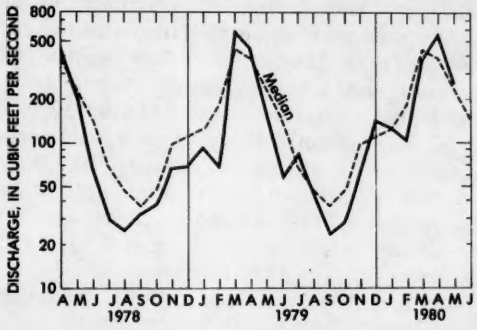
Site	May 1980		April 1980	May 1979
	Discharge in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	750	97	780	750
Miami Canal at Miami (southeastern Florida)	35	23	50	623
Tamiami Canal outlets, 40-mile bend to Monroe	136	4,530	354	60

(Continued from page 5.)

the 4th lowest for May in 61 years of record. In the extreme northern part of the State, where monthly mean discharge of Rainy River at Manitou Rapids (International gaging station) normally increases in May, mean flow decreased sharply, was only 31 percent of median, and was below the normal range.

In southwestern Ontario, mean flow of English River at Umfreville increased seasonally but remained below the normal range and was only 56 percent of median as a result of low carryover flow from April and below-normal runoff during May. In the eastern part of the Province, mean discharge of Missinaibi River at Mattice also increased seasonally but was only 76 percent of the May median discharge and was below the normal range. In southeastern Ontario, mean flow of Saugeen River near Port Elgin decreased seasonally, was near median, and remained in the normal range.

In the southern part of Michigan's Lower Peninsula, monthly mean discharge of Red Cedar River at East Lansing decreased seasonally and remained in the normal range. (See graph.) In the northern part of the Lower



Monthly mean discharge of Red Cedar River at East Lansing, Mich. (Drainage area, 355 sq mi; 919 sq km)

Peninsula, mean flow of Muskegon River at Evart also decreased seasonally and remained in the normal range but was less than median. Also in the northern part of the Lower Peninsula, monthly mean levels of Crooked Lake near Conway, Houghton Lake near Houghton Lake Heights, and Lake Mitchell-Cadillac at Cadillac were, respectively, 0.10 foot above normal, 0.03 foot below normal, and 0.01 foot below normal. In the Upper Peninsula, monthly mean discharge of Sturgeon River near Sidnaw decreased sharply to 39 percent of median and was below the normal range.

In Maumee River basin, in northwestern Ohio and adjacent areas of Indiana and Michigan, monthly mean discharge of Maumee River at Waterville, Ohio, decreased sharply from the above-normal flow of April and was only 58 percent of median but was within the normal range. In the northeastern part of the State, mean flow of Little Beaver Creek near East Liverpool decreased seasonally and remained in the normal range but was greater than median. In the central part of the State, mean flow of Scioto River at Higby also decreased seasonally and remained in the normal range, but was less than median. Storage at monthend in reservoirs in the Mahoning River basin upstream from Newton Falls was 6 percent greater than at the end of April, 1 percent greater than a year ago, and 72 percent of capacity. Storage at monthend in reservoirs in the Scioto River basin upstream from Higby was the same as at the end of April, 1 percent less than a year ago, and 101 percent of normal capacity.

In southern Illinois, monthly mean discharge of Skillet Fork at Wayne City decreased sharply to 44 percent of median, and was in the below-normal range for the first time since June 1979. In the central part of the State, mean flow of Sangamon River at Monticello also decreased sharply to 51 percent of median, and was below the normal range for the 3d time in the past 5 months. In northern Illinois, mean flows of Pecatonica River at Freeport and Rock River near Joslin decreased seasonally and were less than median but remained within the normal range.

In Wisconsin, monthly mean flows decreased seasonally at all index stations, were well below median, and were in the below-normal range except in the eastern part of the State where flow of Fox River at Rapide Croche Dam near Wrightstown was 81 percent of the May median discharge and was within the normal range. In the northwestern part of the State, monthly mean flows of Jump River at Sheldon and Chippewa River at Chippewa Falls decreased sharply to 38 percent and 35 percent of their respective median discharges for the month. In northern and central parts of the State, respectively, mean flows of Oconto River near Gillett and Wisconsin River at Muscoda also decreased into the below-normal range and were 74 percent and 61 percent of the respective median discharges for those stations.

In western Indiana and the adjacent part of the Wabash River basin in eastern Illinois, where monthly mean discharge of Wabash River at Mount Carmel, Ill. was in the above-normal range in April, mean discharge decreased sharply, was in the below-normal range, and was only 70 percent of median. In the northeastern part of the State, monthly mean flow of Mississinewa River at Marion also decreased sharply, was below the normal range, and was only 52 percent of median. Elsewhere in the State, mean flow remained within the normal range.

GROUND-WATER CONDITIONS

Ground-water levels in shallow water-table wells in Minnesota declined and continued below average in the

northern part of the State, but continued above average in the south. In the Minneapolis-St. Paul area, artesian levels began to decline in wells tapping the Prairie du Chien-Jordan and Mt. Simon-Hinckley aquifers. Levels in both continued above average.

In Michigan, levels held fairly steady statewide, continuing slightly above average in the Upper Peninsula, and were somewhat below average in the Lower Peninsula.

In Illinois, the level in the shallow well in glacial drift at Princeton, Bureau County, rose 1 foot and continued more than 3 feet above average.

Levels in Indiana declined except for rises in the southern part of the State; levels were near normal statewide.

In Ohio, levels rose in the central part of the State but declined in the northeast; they were about normal in both areas.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

Streamflow decreased, contrary to the normal seasonal pattern, in Kansas, Missouri, and parts of Iowa, increased seasonally in Texas, and decreased seasonally elsewhere in the region. Monthly mean flows remained in the above-normal range in parts of Louisiana and Nebraska, and increased into that range in parts of Texas. Daily mean flow was highest of record for the month in part of Louisiana. Mean discharges persisted in the below-normal range in parts of South Dakota and decreased into that range in parts of Saskatchewan, Iowa, Missouri, and North Dakota. Flooding occurred in Louisiana, Nebraska, Oklahoma, and Texas.

Ground-water levels declined in North Dakota and Iowa, and mostly declined in Kansas. Trends were mixed in other States. Levels were mostly below average in North Dakota, Iowa, Kansas, and Arkansas, near or slightly above average in Nebraska, and above and below average in Texas. New low levels for May occurred in Kansas and Arkansas. New May high levels were reached in Louisiana, where a new alltime high also was recorded.

STREAMFLOW CONDITIONS

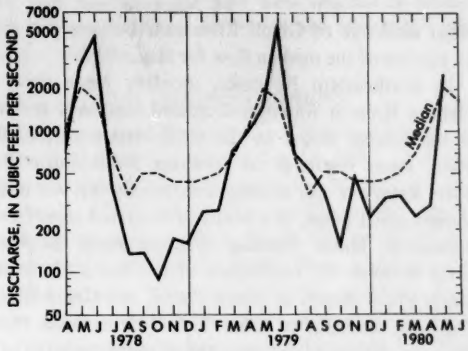
In southwestern Louisiana, severe flooding occurred near midmonth as a result of rapid runoff of intense rainfall. The National Weather Service observed 16.88 inches at Lake Charles in the 24-hour period from 2200 hours on the 15th to 2200 hours on the 16th, a new record for that observation station, and a storm total of 18.99 inches for the 3-day period, May 14–16. Unofficial storm total observations of more than 20 inches were reported to be common in the area between the Sabine River (Texas-Louisiana border), on the west, and Lafayette, on the east, and between Interstate Highway 10, on the north, and the Gulf Coast, on the south. Homes and businesses were flooded in Lake Charles and travelers on Interstate 10 between Lake Charles and Lafayette, a distance of 70 miles, saw a continuous lake on either side of that highway. On the 16th, Interstate 10 was reported closed at the Bayou Grand Marias and the Bayou Lacassine bridges crossing those streams. Many State and parish roads were reported to be inundated and impassable. Peak discharges at gaging stations at U.S. Highway 190, north of Interstate 10, generally were equal to those of a 25-year recurrence interval, and the peak stage on West Fork Calcasieu River at Sam Houston Jones State Park, near the mouth, was about 1 foot higher than the previous maximum stage that was observed May 21, 1953. Upstream, on Calcasieu River near Oberlin, the monthly mean discharge decreased seasonally but remained in the above-normal range for the 3d consecutive month and was 269 percent of median. Similarly, in southeastern Louisiana, mean flow of Amite River near Denham Springs decreased seasonally, remained above the normal range for the 3d consecutive month and was 362 percent of the May median discharge. Also in southeastern Louisiana and the adjacent area of southern Mississippi, mean flow of Pearl River as measured near Bogalusa, La. (drainage area, 6,630 square miles) decreased seasonally but remained above the normal range for the 17th consecutive month. The daily mean discharge of 58,700 cfs on May 20 was highest for the month since records began in October 1938.

In southern Texas, the National Weather Service reported widespread major flooding along portions of Nueces, Frio, and Atascosa Rivers near midmonth, and also reported 14.69 inches of rain in 24 hours, May 15–16, at Derby, in Frio County and in the Frio River basin. That agency also reported minor to moderate flooding in the basins of Nueces, Frio, Atascosa, Navidad, Lavaca, San Antonia, Sabine, Neches, Trinity, Brazos, Navasota, Colorado, and San Jacinto Rivers, and Pine Island Bayou, in southern and southeastern Texas during the period May 16–26. In the extreme eastern part of the State, monthly mean flow of Neches River near Rockland increased seasonally and was in the above-normal range. Mean flows also were reported to have been above the normal range in Brazos River basin upstream from Possum Kingdom Reservoir and in the Gulf Coastal basins. Elsewhere in the State, flows were in the normal range.

In southwestern Oklahoma, during the period May 16–29, major flooding occurred along Salt Fork Red River and North Fork Red River south of Altus, and minor flooding occurred along Washita River near Carnegie, north of Lawton. Downstream, on Washita River near Durwood, where monthly mean flow was only 28 percent of median and below the normal range in April, mean discharge increased sharply to 122 percent of median and was in the normal range. (See graph.)

In Arkansas, mean flows decreased seasonally and were in the normal range. Monthly mean flow of Buffalo River near St. Joe, in the northern part of the State, was less than median for the month, but mean discharge of Saline River near Rye, in southern Arkansas, was about 1½ times median.

In Kansas, monthly mean flows decreased, contrary to the normal seasonal pattern of increasing flows, were in the normal range, and were less than median in the northern part of the State but greater than median in the southern part.

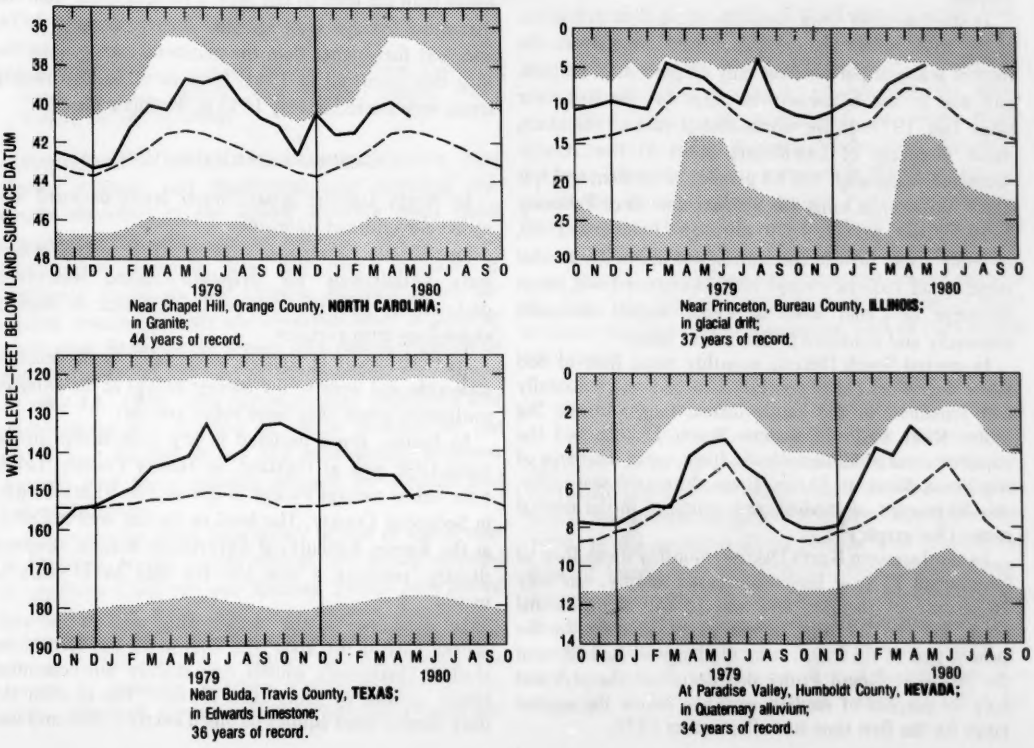


Monthly mean discharge of Washita River near Durwood, Okla. (Drainage area, 7,202 sq mi; 18,652 sq km)

In Missouri, mean discharges also decreased, contrary to the normal seasonal pattern, and were below the normal range. In the south-central part of the State, monthly mean flow of Gasconade River at Jerome was 44 percent of median, and in northwestern Missouri,

MONTH-END GROUND-WATER LEVELS IN KEY WELLS

UNSHADED AREA INDICATES RANGE BETWEEN HIGHEST AND LOWEST RECORD FOR THE MONTH
DOTTED LINE INDICATES AVERAGE OF MONTHLY LEVELS, IN PREVIOUS YEARS
HEAVY LINE INDICATES LEVEL FOR CURRENT PERIOD



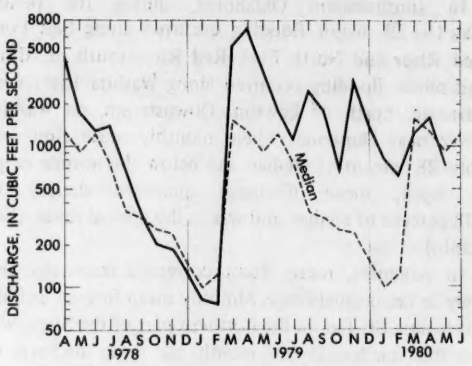
mean discharge of Grand River near Gallatin was only 15 percent of the median flow for May.

In northeastern Nebraska, monthly mean flow of Elkhorn River at Waterloo decreased seasonally and was in the normal range. In the northwestern part of the State, mean discharge of Niobrara River above Box Butte Reservoir also decreased seasonally but was in the above-normal range, as a result of increased runoff near midmonth. Minor flooding occurred along the Platte River between the confluence of the North Platte and South Platte Rivers at North Platte, and Grand Island. The peak discharge of about 13,000 cfs in South Platte River at North Platte was about equal to that of a 10-year flood event, and resulted from runoff of snowmelt and rains in Colorado. Minor flooding occurred also along North Fork Elkhorn River, in northeastern Nebraska, as a result of rapid runoff from rainfall of 5 to 6 inches on May 26, and the peak discharge of 10,600 cfs at the gaging station near Pierce (drainage area, 700 sq mi) has an average return period of about 25 years. In southwestern Nebraska, mean flows of unregulated streams in the Republican River basin ranged from 60 to 90 percent of median, and flows in the north-central part of the State were less than median.

In southwestern Iowa, monthly mean flow of Nishnabotna River above Hamburg decreased, contrary to the normal seasonal pattern, was only 45 percent of median, and was in the below-normal range for the first time since July 1977. In the north-central part of the State, mean discharge of Des Moines River at Fort Dodge decreased seasonally, was 65 percent of median, and was below the normal range for the first time since February 1979. From March 1979 through February 1980, monthly mean flow at this station was above the normal range in all months except one. In eastern Iowa, mean discharge of Cedar River at Cedar Rapids decreased seasonally and remained in the normal range.

In central South Dakota, monthly mean flow of Bad River near Fort Pierre continued to decrease seasonally and remained in the below-normal range. In the Big Sioux River basin in eastern South Dakota and the adjacent areas of Minnesota and Iowa, mean discharge of Big Sioux River at Akron, Iowa, decreased seasonally, was 80 percent of median, and remained in the normal range. (See graph.)

In southwestern North Dakota, monthly mean flow of Cannonball River at Breien decreased sharply, was only 26 percent of median, and was in the below-normal range for the 2d time in the past 3 months. In the eastern part of the State, mean discharge of Red River of the North at Grand Forks also decreased sharply, was only 44 percent of median, and was below the normal range for the first time since September 1977.



Monthly mean discharge of Big Sioux River at Akron, Iowa
(Drainage area, 9,030 sq mi; 23,390 sq km)

In southeastern Saskatchewan, monthly mean discharge of Qu'Appelle River near Lumsden decreased to 16 percent of median, and was below the normal range for the 3d time in the past 7 months, and was less than median for the 9th time in the past 10 months.

In southwestern Manitoba, the level of Lake Winnipeg at Gimli averaged 714.03 feet above mean sea level for the month, 0.25 foot higher than last month, 0.88 foot lower than the level of last May, 2.65 feet lower than the maximum average level for May that occurred in 1974, and 3.51 feet higher than the minimum average level for May that occurred in 1941. Records of Lake Winnipeg levels were started in May 1913 at Winnipeg Beach.

GROUND-WATER CONDITIONS

In North Dakota, ground-water levels declined and were below normal statewide.

In Nebraska, levels rose slightly except in areas where early withdrawals for irrigation caused water-level declines. At month's end, levels were near or slightly above long-term averages.

In Iowa, levels in shallow water-table wells declined statewide and were below average except in the extreme southwest, where they were above average.

In Kansas, levels declined in key wells except in the water-table well at Halstead, in Harvey County. Levels were below average except in the well in Valley Center, in Sedgwick County. The level in the key well at Colby, at the Kansas Agricultural Experiment Station, declined slightly, reaching a new low for May in 33 years of record.

In Arkansas, in the rice-growing area in the east-central part of the State, the level in the key well in the shallow Quaternary aquifer rose slightly but continued below average by more than 5½ feet. The level in the deep Sparta Sand aquifer declined nearly 2 feet, and was

about 4 feet below average. In the Sparta Sand aquifer of central and southern Arkansas, the level in the key well at Pine Bluff showed a slight net rise since the last measurement near the end of March, was about 33 feet below average, and was at a new low level for May in 22 years of record. In the industrial aquifer of south Arkansas—also the Sparta Sand—the level in the key well at El Dorado fell only slightly but continued below average by almost 6 feet.

In Louisiana, levels in wells in the Chicot aquifer of the southwestern area continued seasonal declines, despite heavy rains that curtailed some pumping for rice irrigation during the middle of the month. The level in the observation well near Iowa, La., was nearly 13 feet below the April level. In the New Orleans area and in the Florida Parishes, levels in most wells declined after reaching seasonal highs. Levels in four observation wells in the "600-foot sand" reached record highs, and the level in well EB-123 was at its highest since 1935.

In Texas, in the artesian Edwards Limestone aquifer, the level in the key well at Austin declined and was below average, whereas the level in the well at San Antonio rose and was above average. The artesian level in the key well in the Evangeline aquifer at Houston rose but continued below average.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

Streamflow was variable in Arizona, California, New Mexico, Oregon, and Washington, and increased seasonally elsewhere in the region. Monthly mean flows remained in the below-normal range in parts of Washington and decreased into that range in parts of California, Colorado, and Oregon. Monthly mean discharges remained in the above-normal range in parts of most other States in the region. The violent eruption of Mount St. Helens Volcano in southwestern Washington on May 18, 1980, with accompanying mudflows and glacial meltwater, resulted in severe flooding on the Toutle and Cowlitz Rivers and monumental sediment deposits that have partially plugged the Cowlitz and Columbia Rivers.

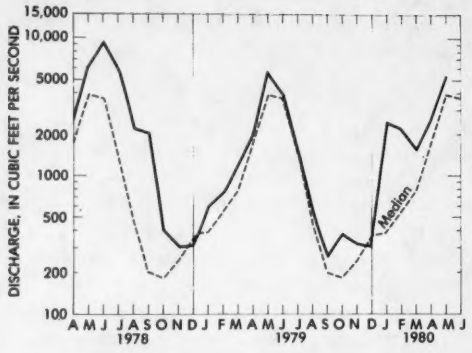
Ground-water levels held steady or rose in Idaho, rose in Montana, mostly rose in Nevada, and mostly declined in southern California and Arizona. Trends were mixed in Washington, Utah, and New Mexico. Levels were below average in Washington and Arizona, mostly below average in Idaho and New Mexico, and above and below average in Montana, southern California, Nevada, and Utah. New high levels for May occurred in Nevada and Utah, and new lows for May were reached in Idaho, Utah, Arizona, and New Mexico. A new alltime low was recorded in Idaho.

STREAMFLOW CONDITIONS

In southwestern Washington, a major eruption of Mount St. Helens Volcano on May 18, 1980, produced major mudflows and destroyed the glaciers on the mountain's north slope. The mudflows and glacial meltwater triggered a flash flood that produced unprecedented flooding in the Toutle River, which empties into the Cowlitz River about 2 miles upstream from Castle Rock, Wash. The peak discharge of about 115,000 cfs at Toutle River near Silver Lake (drainage area, 474 square miles) was about 3 times the previous peak of record of 43,200 cfs that occurred on December 2, 1977. Downstream, on the Cowlitz River at Castle Rock (drainage area, 2,238 square miles), the peak discharge of 123,000 cfs on May 19, 1980 was only 12 percent below the peak of record of 139,000 cfs which occurred at that site in December 1933. The sediment carried downstream into the Cowlitz and Columbia Rivers has caused disruption of shipping to the ports of Portland, Kalama, and Longview. Sediment deposits of from 12 to 18 feet in the lower Cowlitz River pose a flood potential since normal flows now cause bankfull stages in the Kelso-Longview area. Also, the mudflows formed a shoal approximately 9½ miles long in the Columbia River and preliminary estimates by the Corps of Engineers indicate the plug contains about 25 million cubic yards of materials. In eastern Washington, monthly mean discharge of the index station on Spokane River at Spokane remained in the below-normal range for the 6th time in the past 8 months and decreased into that range in Chehalis River near Grand Mound in the western part of the State.

In Oregon, streamflow was within the normal range in the John Day River basin and in the below-normal range at index stations located on streams west of the Cascade Mountains.

In north-coastal California, monthly mean discharge of Smith River near Crescent City decreased sharply to 61 percent of median and was below the normal range. Similarly, mean flow of Sacramento River at Verona decreased seasonally to 60 percent of median and was below the normal range for the first time since May 1979. In the southern Sierra Nevada west slope, mean flow of Kings River above North Fork, near Trimmer, increased seasonally to 136 percent of median, and was above the normal range for the 4th time in the past 5 months. (See graph on page 12.) In southern California, high carryover flow held mean flow of Arroyo Seco near Pasadena in the above-normal range for the 5th



Monthly mean discharge of Kings River above North Fork, near Trimmer, Calif. (Drainage area, 952 sq mi; 2,466 sq km)

consecutive month. Combined contents of 10 reservoirs in northern California were 109 percent of average and 103 percent of the contents one year ago.

In north-central Nevada, monthly mean flow of Humboldt River at Palisade increased seasonally as a result of runoff from snowmelt, was more than twice the May median flow, and was above the normal range. In southeastern Nevada and the adjacent areas of Utah and Arizona, monthly mean discharge of Virgin River, as measured at Littlefield, Ariz., increased, contrary to the normal seasonal pattern of decreasing flow, was 7½ times median, and remained in the above-normal range for the 5th consecutive month.

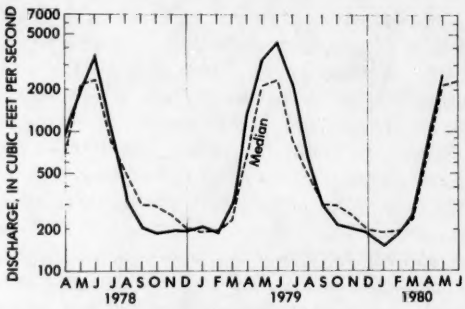
In Utah, streamflow increased seasonally and ranged from 65 percent of median at Whiterocks River near Whiterocks to 198 percent of median at San Juan River near Bluff. In southeastern Utah, monthly mean flows were above the normal range at index stations at San Juan River near Bluff, Colorado River near Cisco, and Green River at Green River; elsewhere, flows were within the normal range. Unseasonably cool and stormy weather retarded snowmelt runoff from higher elevations during the month.

Contents of the Colorado River Storage Project increased 2,852,470 acre-feet during the month.

In central Arizona, monthly mean discharge of Verde River below Tangle Creek, above Horseshoe Dam continued to decrease seasonally but remained in the above-normal range for the 5th consecutive month as a result of high carryover flow from April. In northeastern Arizona, mean flow of Little Colorado River near Cameron decreased seasonally but was 211 times the May median flow and remained in the above-normal range for the 4th consecutive month. Similarly, in east-central Arizona, monthly mean flow of Salt River near Roosevelt remained in the above-normal range for the 4th consecutive month. In the southern part of the State, the seasonal decrease in flow at Gila River at head of Safford Valley, near Solomon and San Pedro River at Charleston was less than normal and mean flows at both sites increased into the above-normal range.

In northern New Mexico, monthly mean flow of Rio Grande below Taos Junction Bridge, near Taos, increased sharply to 272 percent of median and remained in the above-normal range for the 2d consecutive month. Elsewhere in the State, mean flows at index stations increased seasonally except in the Gila River basin and were above median but within the normal range at all sites. Storage increased in all major reservoirs and was the highest in several years at Elephant Butte Reservoir.

In northeastern Colorado, runoff from heavy rains during the first part of the month along the Front Range caused moderate flooding along the South Platte River. East of the Continental Divide in central Colorado, monthly mean discharge of Bear Creek at Morrison increased sharply to nearly 5 times the median flow and remained in the above-normal range for the 5th consecutive month. By contrast, the seasonal increase in mean flow of Roaring Fork River at Glenwood Springs (west of the Continental Divide) was less than the normal amount and flow at that site was below the normal range for the first time since October 1979. In the southwestern part of the State, monthly mean discharge of Animas River at Durango increased sharply but remained in the normal range for the 4th consecutive month. (See graph.)



Monthly mean discharge of Animas River at Durango, Colo. (Drainage area, 692 sq mi; 1,792 sq km)

In southern Wyoming, monthly mean discharge of North Platte River above Seminoe Reservoir, near Sinclair, continued to increase seasonally, was more than twice the median flow, and remained in the above-normal range for the 5th consecutive month. In the northern part of the State, mean flow of Tongue River near Dayton increased seasonally and was within the

normal range but remained below median for the 15th consecutive month.

In Idaho, streamflow increased seasonally, was near or slightly above median, and remained in the normal range at all index stations. Reservoir storage was generally near or above average.

In southern Montana, mean flow of Yellowstone River at Billings increased sharply to over 3 times the April mean discharge and remained in the above-normal range for the 2d consecutive month. In the northwestern part of the State, monthly mean flow of Middle Fork Flathead River near West Glacier continued to increase seasonally, was 126 percent of median, and remained in the above-normal range. Elsewhere in the State, monthly mean flows at index stations were above median but within the normal range.

In southwestern Alberta, monthly mean discharge of Bow River at Banff increased sharply to 258 percent of median and remained in the above-normal range.

In British Columbia, streamflow increased seasonally and was near the median flow at both index stations.

GROUND-WATER CONDITIONS

In Washington, the artesian ground-water level in the key well at Tacoma, in the western part of the State, declined nearly 1½ feet but was more than 3½ feet above average. The level in the key water-table well in Spokane Valley in the east rose more than a foot but continued below average by more than 5 feet.

In Idaho, the level in the key well in the sand and gravel aquifer in the Boise Valley rose nearly 5 feet and was 2½ feet above average. Levels in the key wells in the Snake River Plain aquifer held steady near Atomic City but was at a new low for May in 31 years of record. The level in the well near Eden in the same aquifer was more than 6 feet below average and at a new alltime low in 23 years of record. The level in the well near Gooding in this aquifer was nearly 6 feet below average. In the alluvial aquifer in northern Idaho, underlying the Rathdrum Prairie, the level in the key well was more than 4 feet below average.

In Montana, the level in the Stahl water-table well at Missoula, in Quaternary gravel, rose more than 6½ feet and was about 1¼ feet above average. The level in the water-table well at Hamilton Fairgrounds, also in Quaternary alluvium, rose nearly 3 feet but was nearly 2 feet below average.

In southern California, the artesian level of the key well in the Los Alamitos area of Orange County declined 0.3 foot and continued below average. In Los Angeles County, the level of the key water-table well near Baldwin Park rose 2.87 feet but remained below average. In Santa Barbara County the artesian level of the key well in the Santa Ynez Valley declined 0.63 foot but was nearly 8 feet above average. The level of the key water-table well in the Santa Maria Valley declined 4.48 feet and remained more than 7 feet above average. In the Upper Cuyama Valley at Cuyama, the level of the key water-table well declined 3.71 feet but continued more than 70 feet above average.

In Nevada, the level in the key well in Las Vegas Valley rose, but continued below average by nearly 60 feet. The level in the water-table well at Paradise Valley decreased slightly but continued above average by nearly 2 feet. At Truckee Meadows, the level rose about ½ foot but continued more than a foot below average. The artesian level in the well in Steptoe Valley rose slightly, was more than 2 feet above average, and reached a new high level for May in 30 years of record.

In Utah, ground-water levels rose in wells in the Logan and Holladay areas, and were above and below average, respectively. Despite the rise in the well in the Holladay area, the level was at a new low for May in 32 years of record. Levels declined in the Flowell and Blanding areas, and were below and above average, respectively. In the Blanding area, the level in the key well reached a new high for May, in spite of the slight net decline since the end of April; records have been maintained in this well for 20 years.

In Arizona, levels declined in four index wells, including the well in valley fill in the Elfrida area, in which the level reached a new low level for May in 29 years of record. The level in one of the other wells also reached a new May low. The level in the water-table well, City of Tucson No. 2, rose slightly but continued more than 22 feet below average.

In New Mexico, levels in the Hma and Lovington water-table wells declined slightly and continued below average. The level in the Hagerman West water-table well rose about 3 feet since the last measurement near the end of March, and continued more than 21 feet below average. The level in the Berrendo-Smith artesian well rose about ½ foot and was more than ½ foot above average. Despite a rise of nearly a foot in the Dayton water-table well in the southern part of the Roswell basin, the level was at a new May low in 42 years of record.

ALASKA

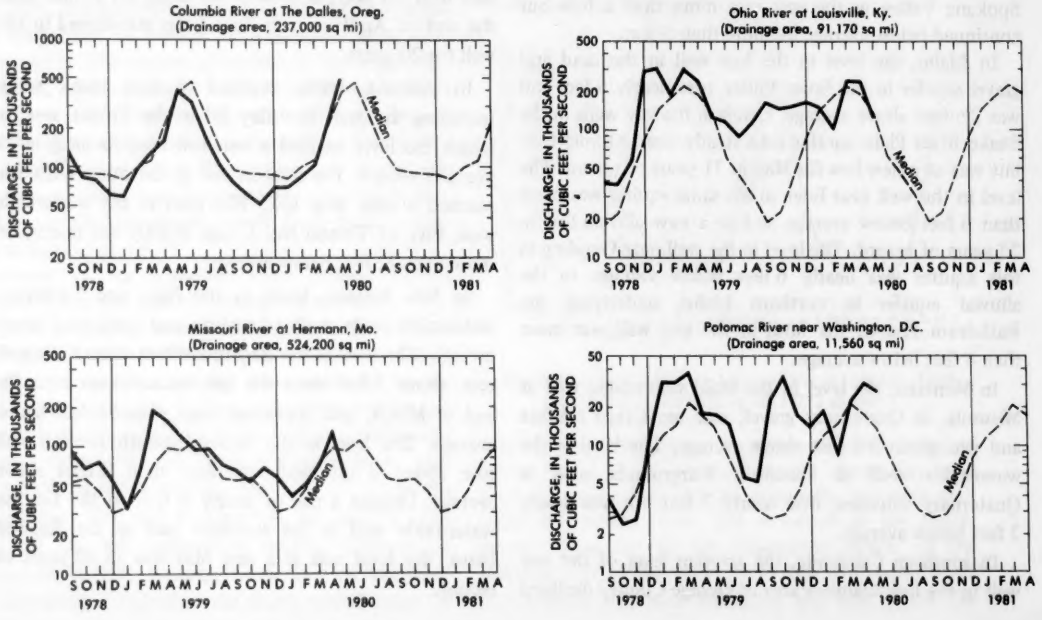
Streamflow increased seasonally at all index stations in the State but was below the normal range at those stations in the interior. For example, in east-central Alaska, the monthly mean discharge 1,262 cfs in Chena River at Fairbanks (drainage area, 1,980 square miles) was only 32 percent of median, was below the normal range, and was the lowest observed flow for May since the record began in 1948. In the adjacent basin of Tanana River, mean flow at Nenana also was below the normal range and was only 57 percent of the median discharge for May. Similarly, in the south-central part of the State, monthly mean flow of Little Susitna River near Palmer was in the below-normal range and 61 percent of median. These below-normal flows were attributed to light snowpack in some areas, below-normal temperatures in some areas, and little or no precipitation throughout the interior region. In the south-coastal area, mean flow of Kenai River at Cooper Landing remained above the normal range for the 8th consecutive month as a result of high carryover flow from the record high discharge of April augmented by increased runoff from rain at monthend. In southeastern Alaska, monthly mean flow of Gold Creek at Juneau increased seasonally and was within the normal range.

Ground-water levels in confined aquifers in the Anchorage area declined from last month with the exception of one area where levels rose about a foot. Declines were as much as 3 to 4 feet in the southwest and east-central areas. However, levels did not approach record lows established for those wells.

HAWAII

Streamflow decreased seasonally at all index stations in the State but remained in the above-normal range except on the island of Hawaii. On the island of Maui, monthly mean flow of Honopou Stream near Huelo was 172 percent of median and remained above the normal range for the 5th time in the past 7 months. Similarly, on the island of Oahu, mean discharge of Kalihi Stream near Honolulu was 2½ times median and was above the normal range for the 4th time in the past 5 months. Mean flow of East Branch of North Fork Wailua River near Lihue (island of Kauai) was 1½ times the median discharge for May and remained in the above-normal range for the 2nd consecutive month. Monthly mean flow of Waiakea Stream near Mountain View (island of Hawaii) was in the normal range but remained above median for the 3d consecutive month.

HYDROGRAPHS OF FOUR LARGE RIVERS



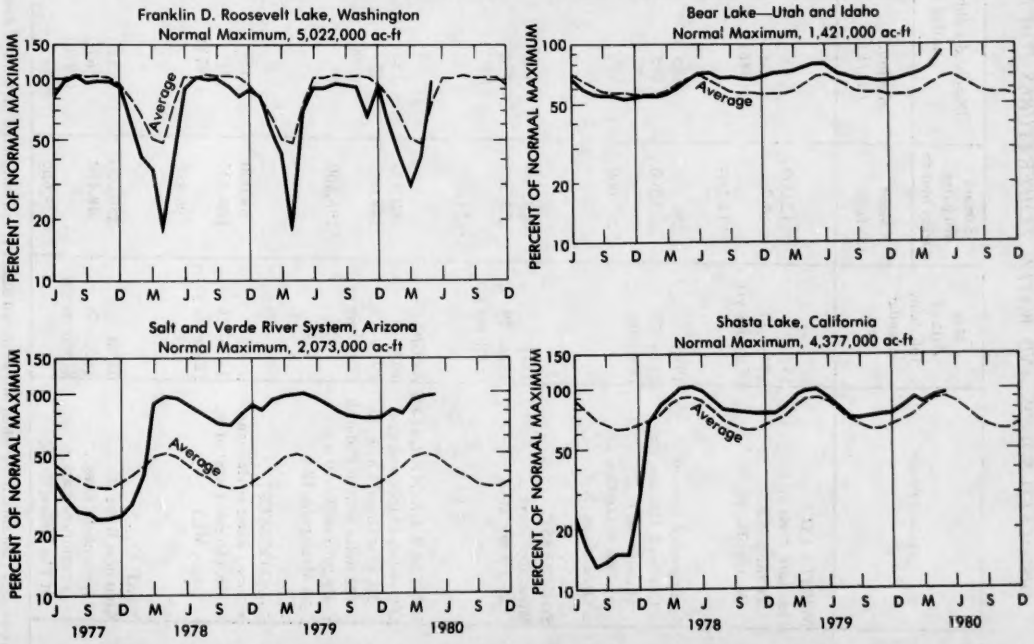
DISSOLVED SOLIDS AND WATER TEMPERATURES FOR MAY ON SIX LARGE RIVERS

The table on page 16 shows dissolved-solids and temperature data for May at six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). NASQAN, as established by the U.S. Department of the Interior, Geological Survey, is designed to describe the water quality of the Nation's streams and rivers on a systematic and continuing basis, so as to meet many of the information needs of those involved in national or regional water-quality planning and management.

"Dissolved solids," as described in several columns of the table, are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. These same minerals are among the most common components of the Earth's solid rocks and minerals, but gradually erode and at least partly dissolve as a part of natural weathering processes. Collectively these and other dissolved minerals constitute the dissolved-solids concentration expressed in milligrams per liter (mg/L) or the generally equivalent expression, parts per million (parts of dissolved matter in one million parts of water, by weight). Values of dissolved solids are convenient for comparing the quality of water from one time to another and from one place to another. Most drinking water contains between 50 and 500 mg/L of dissolved solids.

"Dissolved-solids discharge," expressed in tons per day, represents the total daily amount of dissolved minerals carried by the stream and is calculated by multiplying the dissolved-solids concentration (in mg/L) by the stream discharge (in cfs; times a unit conversion factor of .0027). Even though dissolved-solids *concentrations* are generally higher during periods of low streamflow than of high streamflow, the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, JUNE 1977 TO MAY 1980



Near- or above-average contents continued to characterize most reservoirs in the West during May. Storage increased sharply in Franklin D. Roosevelt Lake in Washington as a result of snowmelt runoff. (See graph above.)

Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR MAY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	May data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean	Minimum	Maximum	Mean, in °C	Minimum, in °C	Maximum, in °C
						(tons per day)					
	NORTHEAST										
01463500	Delaware River at Trenton, N.J. (Morrisville, Pa.)	1980	12,000	78	119	2,950	1,530	7,040	18.0	11.5	22.5
		1945–79	14,780	50	123	.....	930	12,500	.....	10.0	28.5
		(Extreme yr)		(1946)	(1978)		(1965)	(1968)			
			[c]14,300								
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, N.Y. median streamflow at Ogdensburg, N.Y.	1980	296,000	165	166	132,000	128,000	135,000	9.5	7.0	12.5
		1976–79	303,500	165	168	136,000	123,000	153,000	9.0	4.0	12.0
		(Extreme yr)		(1977–79)	(1976, 1978)		(1977)	(1976)			
			[c]257,000								
	SOUTHEAST										
07289000	Mississippi River at Vicksburg, Miss.	1980	668,500	198	254	410,000	271,000	608,000	19.5	17.0	23.5
		1976–79	823,300	178	237	458,000	176,000	838,000	19.5	14.5	26.0
		(Extreme yr)		(1977)	(1978)		(1977)	(1979)			
			[c]854,600								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill. (25 miles west of Paducah, Ky.; streamflow station at Metropolis, Ill.)	1980	280,000	180	267	.....	73,200	250,000	.....	15.0	20.0
		1955–79	344,000	156	287	.....	25,500	309,000	.....	6.5	25.0
		(Extreme yr)		(1976)	(1979)		(1976)	(1978)			
			[c]296,500								
	MIDCONTINENT										
06934500	Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.)	1980	58,000	409	476	69,500	63,800	76,700	20.0	16.0	23.5
		1976–79	104,000	211	439	87,800	44,500	174,000	19.0	13.0	24.5
		(Extreme yr)		(1978)	(1976)		(1977)	(1978)			
			[c]90,880								
	WEST										
14128910	Columbia River at Warrendale, Oreg. (streamflow station at The Dalles, Oreg.)	1980	250,000	83	109	63,400	49,500	84,000	13.5	12.0	14.5
		1976–79	248,400	67	144	64,200	37,500	100,000	12.5	10.5	15.0
		(Extreme yr)		(1976)	(1977)		(1977)	(1976)			
			[c]334,600								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1941–70, for comparison with data for current month.

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MAY 1980

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Apr. 1980	End of May 1980	End of May 1979	Average for end of May	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	75	75	91	77	226,300 (a)
QUEBEC					
Allard (P)	76	91	88	87	280,600 ac-ft
Gouin (P)	67	75	64	59	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	60	69	101	90	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	62	86	92	87	3,330 mcf
Lake Francis (FPR)	66	83	94	82	4,326 mcf
Lake Winnipesaukee (PR)	100	100	116	101	7,220 mcf
VERMONT					
Harriman (P)	87	82	91	87	5,060 mcf
Somerset (P)	72	79	91	86	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	92	90	99	90	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	97	99	99	98	34,270 mcf
Indian Lake (FMP)	82	91	99	104	4,500 mcf
New York City reservoir system (MW)	100	98	102	.....	547,500 mg
NEW JERSEY					
Wanaque (M)	101	99	103	95	27,730 mg
PENNSYLVANIA					
Allegheny (FPR)	38	48	49	46	51,400 mcf
Pymatuning (FMR)	98	102	98	99	8,191 mcf
Raystown Lake (FR)	68	68	68	57	33,190 mcf
Lake Wallenpaupack (PR)	82	85	81	85	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	100	101	101	95	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	100	96	93	92	12,580 mcf
Narrows (Badin Lake) (P)	97	98	95	100	5,616 mcf
High Rock Lake (P)	91	92	87	82	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	94	97	96	82	70,300 mcf
Lakes Marion and Moultrie (P)	90	91	88	79	81,100 mcf
SOUTH CAROLINA—GEORGIA					
Clark Hill (FP)	81	89	84	76	75,360 mcf
GEORGIA					
Burton (PR)	96	98	100	93	104,000 ac-ft
Sinclair (MPR)	92	88	85	93	214,000 ac-ft
Lake Sidney Lanier (FMPR)	69	67	66	67	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	99	99	100	95	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	68	71	73	66	1,156,000 cfsd
Douglas Lake (FPR)	77	88	89	71	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	90	94	94	83	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	71	71	86	71	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	87	94	95	84	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	63	66	97	86	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	62	62	92	82	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	28	26	44	37	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	81	81	92	88	22,700,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	99	95	97	89	127,600 ac-ft
Bell Fourche (I)	65	49	92	73	185,200 ac-ft
Lake Francis Case (FIP)	75	76	80	83	4,834,000 ac-ft
Lake Oahe (FIP)	86	83	97	.....	22,530,000 ac-ft

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Apr. 1980	End of May 1980	End of May 1979	Average for end of May	Normal maximum
	Percent of normal maximum				
MIDCONTINENT REGION—Continued					
SOUTH DAKOTA—Continued					
Lake Sharpe (FIP)	101	101	102	100	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	76	80	79	86	477,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	84	91	75	79	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	82	101	104	94	2,378,000 ac-ft
Keystone (FPR)	95	106	106	107	661,000 ac-ft
Tenkiller Ferry (FPR)	101	106	105	102	628,200 ac-ft
Lake Altus (FIMR)	72	83	73	68	133,000 ac-ft
Lake O'The Cherokees (FPR)	97	96	102	93	1,492,000 ac-ft
OKLAHOMA—TEXAS					
Lake Texoma (FMPRW)	82	93	104	103	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	30	30	50	52	386,400 ac-ft
Canyon (FMR)	93	95	100	77	385,600 ac-ft
International Amistad (FIMPW)	90	88	100	79	3,497,000 ac-ft
International Falcon (FIMPW)	76	66	100	66	2,668,000 ac-ft
Livingston (IMW)	101	104	105	85	1,788,000 ac-ft
Possum Kingdom (IMPRW)	84	92	95	99	570,200 ac-ft
Red Bluff (PI)	24	23	33	27	307,000 ac-ft
Toledo Bend (P)	100	103	100	91	4,472,000 ac-ft
Twin Buttes (FIM)	36	40	64	30	177,800 ac-ft
Lake Kemp (IMW)	49	62	57	91	268,000 ac-ft
Lake Meredith (FMW)	27	27	30	36	821,300 ac-ft
Lake Travis (FIMPRW)	87	92	99	82	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	23	71	70	56	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	41	100	70	75	5,022,000 ac-ft
Lake Chelan (PR)	26	85	64	73	676,100 ac-ft
Lake Cushman	101	101	101	95	359,500 ac-ft
Lake Merwin (P)	97	104	105	104	245,600 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	85	97	90	80	1,235,000 ac-ft
Coeur d'Alene Lake (P)	110	103	132	125	238,500 ac-ft
Pend Oreille Lake (FP)	47	96	94	80	1,561,000 ac-ft
IDAHO—WYOMING					
Upper Snake River (8 reservoirs) (MP)	85	94	84	77	4,401,000 ac-ft
WYOMING					
Boysen (FIP)	65	85	69	64	802,000 ac-ft
Buffalo Bill (IP)	54	75	56	74	421,300 ac-ft
Keyhole (F)	75	73	85	52	190,400 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	53	78	66	57	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	13	44	1	13	364,400 ac-ft
Taylor Park (IR)	49	67	43	72	106,200 ac-ft
Colorado–Big Thompson project (I)	68	77	54	62	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	81	90	77	.....	31,620,000 ac-ft
UTAH—IDAHO					
Bear Lake (IPR)	79	92	80	68	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	72	83	99	88	1,000,000 ac-ft
Hetch Hetchy (MP)	58	72	72	69	360,400 ac-ft
Isabella (FIR)	65	87	70	42	568,100 ac-ft
Pine Flat (FI)	62	74	94	71	1,001,000 ac-ft
Clair Engle Lake (Lewiston) (P)	89	96	85	90	2,438,000 ac-ft
Lake Almanor (P)	85	94	78	63	1,036,000 ac-ft
Lake Berryessa (FIMW)	96	94	77	86	1,600,000 ac-ft
Millerton Lake (FI)	51	69	92	79	503,200 ac-ft
Shasta Lake (FIPR)	94	96	100	91	4,377,000 ac-ft
CALIFORNIA—NEVADA					
Lake Tahoe (IPR)	47	71	32	68	744,600 ac-ft
NEVADA					
Rye Patch (I)	84	84	60	65	194,300 ac-ft
ARIZONA—NEVADA					
Lake Mead and Lake Mohave (FIMP)	88	88	86	69	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	92	89	100	18	1,073,000 ac-ft
Salt and Verde River system (IMPR)	97	98	99	49	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	44	54	32	82	330,100 ac-ft
Elephant Butte and Caballo (FIPR)	41	49	23	30	2,453,000 ac-ft

[a]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

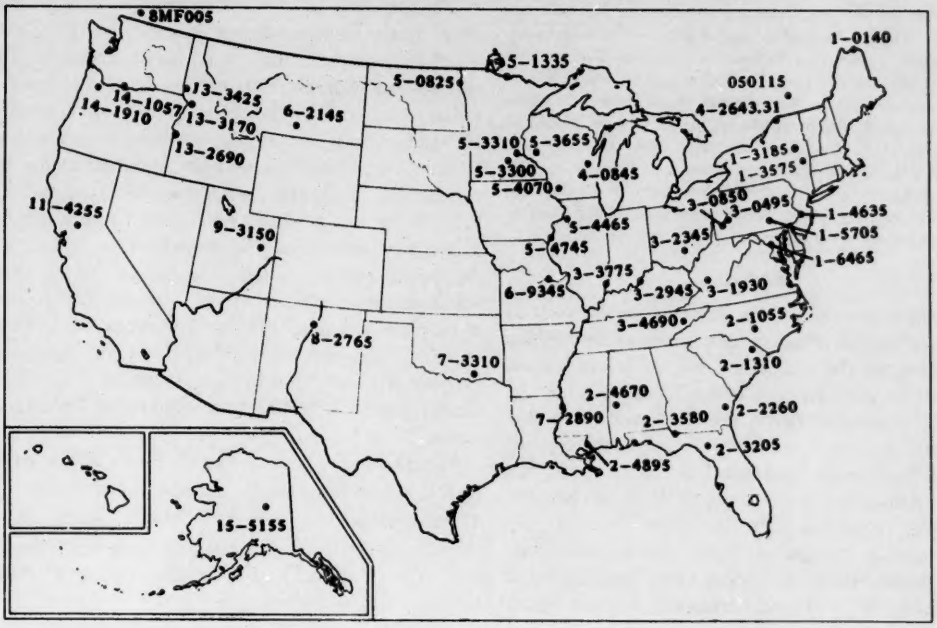
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING MAY 1980

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1975 (cfs)	Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month (cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine	5,690	9,549	14,420	46	- 47	6,000	3,900	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,853	3,070	69	- 62	1,550	1,000	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,630	3,360	55	- 69	.....	.....	.....
1–4635	Delaware River at Trenton, N.J	6,780	11,630	12,500	87	- 51	9,420	6,090	22
1–5705	Susquehanna River at Harrisburg, Pa	24,100	34,200	39,970	79	- 57	22,100	14,300	30
1–6465	Potomac River near Washington, D.C	11,560	[1]11,190	26,250	197	- 15	16,800	10,900	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C	4,810	5,007	3,430	109	- 55	1,700	1,100	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,657	10,800	152	- 61	14,200	9,180	28
2–2260	Altamaha River at Doctortown, Ga	13,600	13,780	11,770	98	- 77	12,500	8,080	28
2–3205	Suwannee River at Branford, Fla	7,880	6,970	12,500	187	- 41	10,300	6,660	30
2–3580	Apalachicola River at Chattahoochee, Fla	17,200	22,330	34,700	172	- 44	47,200	30,500	30
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	22,570	42,900	273	- 64	30,300	19,600	30
2–4895	Pearl River near Bogalusa, La	6,630	9,263	29,980	302	- 55	25,700	16,600	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1]19,210	17,650	73	- 62	12,400	8,010	27
3–0850	Monongahela River at Braddock, Pa	7,337	[1]12,360	19,500	141	- 27	24,100	15,600	27
3–1930	Kanawha River at Kanawha Falls, W.Va	8,367	12,530	15,570	123	- 44	24,800	16,000	26
3–2345	Scioto River at Higby, Ohio	5,131	4,513	4,748	84	- 45	5,200	3,360	27
3–2945	Ohio River at Louisville, Ky[3]	91,170	114,100	128,000	95	- 48	161,000	104,000	26
3–3775	Wabash River at Mount Carmel, Ill	28,635	27,030	24,360	70	- 64	25,000	16,200	31
3–4690	French Broad River below Douglas Dam, Tenn	4,543	[1]6,794	8,217	129	- 42	.....	.....	.....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,185	3,810	81	- 4	.....	.....	.....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	241,100	295,900	115	+ 7	295,000	191,000	31
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,300	31,500	54	- 30	12,700	8,210	30
5–0825	Red River of the North at Grand Forks, N. Dak	30,100	2,524	1,995	44	- 77	1,150	740	31
5–1335	Rainy River at Manitou Rapids, Minn	19,400	12,950	6,410	31	- 50	5,140	3,320	21
5–3300	Minnesota River near Jordan, Minn	16,200	3,412	2,760	54	- 62	2,370	1,530	22
5–3310	Mississippi River at St. Paul, Minn	36,800	[1]10,580	8,280	39	- 63	6,970	4,500	22
5–3655	Chippewa River at Chippewa Falls, Wis	5,600	5,110	2,420	35	- 73	.....	.....	.....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,613	6,496	61	- 52	.....	.....	.....
5–4465	Rock River near Joslin, Ill	9,551	5,852	5,040	81	- 43	5,000	3,200	31
5–4745	Mississippi River at Keokuk, Iowa	119,000	62,570	46,990	54	- 54	30,600	19,800	31
6–2145	Yellowstone River at Billings, Mont	11,796	6,986	18,430	142	+207	20,000	13,000	31
6–9345	Missouri River at Hermann, Mo	524,200	79,750	56,170	62	- 56	52,800	34,100	27
7–2890	Mississippi River at Vicksburg, Miss[4]	1,140,500	573,600	668,500	78	- 47	685,000	443,000	27
7–3310	Washita River near Durwood, Okla	7,202	1,414	2,535	122	+ 731	10,000	6,500	31
8–2765	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	724	3,090	272	+ 219	4,000	2,600	31
9–3150	Green River at Green River, Utah	40,600	6,366	25,440	179	+ 240	30,000	19,000	31
11–4255	Sacramento River at Verona, Calif	21,257	19,150	11,610	60	- 30	13,400	8,660	28
13–2690	Snake River at Weiser, Idaho	69,200	18,170	27,530	109	+ 37	34,900	22,600	27
13–3170	Salmon River at White Bird, Idaho	13,550	11,290	39,210	124	+ 205	37,800	24,400	27
13–3425	Clearwater River at Spalding, Idaho	9,570	15,570	31,840	62	+ 73	37,200	24,000	28
14–1057	Columbia River at The Dalles, Oreg[5]	237,000	194,600	507,500	129	+ 107	.....	.....	.....
14–1910	Willamette River at Salem, Oreg	7,280	23,810	12,700	57	- 56	9,730	6,290	26–31
15–5155	Tanana River at Nenana, Alaska	25,600	23,850	20,260	57	+ 132	.....	.....	.....
8MF005	Fraser River at Hope, British Columbia	83,800	96,400	180,100	101	+ 195	143,000	92,400	30

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS



Location of stream-gaging stations on large rivers listed in table on page 18.

WATER RESOURCES REVIEW

May 1980

Based on reports from the Canadian and U.S. field offices; completed June 11, 1980

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for May based on 20 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for May 1980 is compared with flow for May in the 30-year reference period 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for May is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the May flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of May. Water level in each key observation well is compared with average level for the end of May determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of April to the end of May.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

AVAILABILITY AND QUALITY OF GROUND WATER, SOUTHERN UTE INDIAN RESERVATION, SOUTHWESTERN COLORADO

The abstract and accompanying illustrations and table are from the report, *Availability and quality of ground water, Southern Ute Indian Reservation, southwestern Colorado,* by Robert E. Brogden, E. Carter Hutchinson, and Donald E. Hillier: U.S. Geological Survey Water-Supply Paper 1576-J, 28 pages, 1979. This report may be purchased for $1.75 from Branch of Distribution. U.S. Geological Survey, 1200 S. Eads St., Arlington, Va. 22202 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

ABSTRACT

Population growth and the potential development of subsurface mineral resources have increased the need for information on the availability and quality of ground water on the Southern Ute Indian Reservation (fig. 1). The U.S. Geological Survey, in cooperation with the Southern Ute Tribal Council, the Four Comers Regional Planning Commission, and the U.S. Bureau of Indian Affairs, conducted a study during 1974–76 to assess the ground-water resources of the reservation.

Water occurs in aquifers in the Dakota Sandstone, Mancos Shale, Mesaverde Group, Lewis Shale, Pictured Cliffs Sandstone, Fruitland Formation, Kirtland Shale, Animas and San Jose Formations, and terrace and flood-plain deposits. Well yields from sandstone and shale aquifers are small, generally in the range from 1 to 10 gallons per minute with maximum reported yields of 75 gallons per minute. Well yields from terrace deposits generally range from 5 to 10 gallons per minute with maximum yields of 50 gallons per minute. Well yields from flood-plain deposits are as much as 25 gallons per minute but average 10 gallons per minute.

Water quality in aquifers depends in part on rock type. Water from sandstone, terrace, and flood-plain aquifers is predominantly a calcium bicarbonate type, whereas water from shale aquifers is predominantly a sodium bicarbonate type. Water from rocks containing interbeds of coal or carbonaceous shales may be either a calcium or sodium sulfate type. Dissolved-solids concentrations of ground water ranged from 115 to 7,130 milligrams per liter. Water from bedrock aquifers is the most mineralized, while water from terrace and flood-plain aquifers is the least mineralized. In many water samples collected from bedrock, terrace, and flood-plain aquifers, the concentrations of arsenic, chloride, dissolved solids, fluoride, iron, manganese, nitrate, selenium, and sulfate exceeded U.S. Public Health Service (1962) recommended limits for drinking water.

Selenium in the ground water in excess of U.S. Public Health Service (1962) recommended limit of 10 micrograms per liter for drinking water occurs throughout the reservation but principally in the central part. (See Table 1.) Of the 265 wells and springs sampled, 74 contained water with selenium concentrations in excess of the recommended limit. Selenium concentrations exceeded 10 micrograms per liter principally in water from aquifers in the San Jose and Animas Formations. The maximum selenium concentration determined during the study was 13,000 micrograms per liter in a sample obtained from the San Jose Formation. The only known documented case of human selenium poisoning caused by drinking ground water occurred on the reservation.

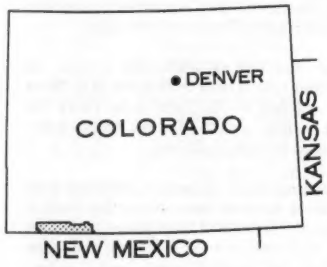

Figure 1.—Southern Ute Indian Reservation (shaded).

TABLE 1.—*Occurrence of dissolved constituents exceeding U.S. Public Health Service (1962) recommended limits for drinking water in wells and springs*
[mg/L = milligrams per liter; μg/L = micrograms per liter]

Geologic unit	Total number of wells and springs sampled	Number of wells and springs containing water exceeding limits (shown in parentheses) for indicated constituent: Dissolved solids (500 mg/L)	Arsenic (10 μg/L)	Chloride (250 mg/L)	Fluoride (1.3 mg/L)	Iron (300 μg/L)	Manganese (50 μg/L)	Nitrite plus nitrate as N (10 mg/L) or nitrate as NO_3 (10 mg/L)	Selenium (10 μg/L)	Sulfate (250 mg/L)
Flood-plain deposits	34	9	1	0	1	1	2	0	3	4
Terrace deposits	28	8	0	1	1	1	0	0	6	1
San Jose Formation	52	34	5	5	24	4	6	7	27	6
Animas Formation	100	38	11	4	34	5	12	3	33	16
Kirtland Shale	4	4	1	0	0	3	3	0	0	0
Fruitland Formation	2	2	0	0	0	1	1	0	0	1
Pictured Cliffs Sandstone	3	2	0	0	1	0	0	0	0	1
Lewis Shale	20	19	0	2	0	2	0	1	4	13
Mesaverde Group	21	17	0	0	9	4	1	0	0	6
Mancos Shale	1	1	0	0	0	0	0	0	1	1